

# The Luminous Blue Variables in M33: The Extended Hot Phase of Romano's Star (GR 290)

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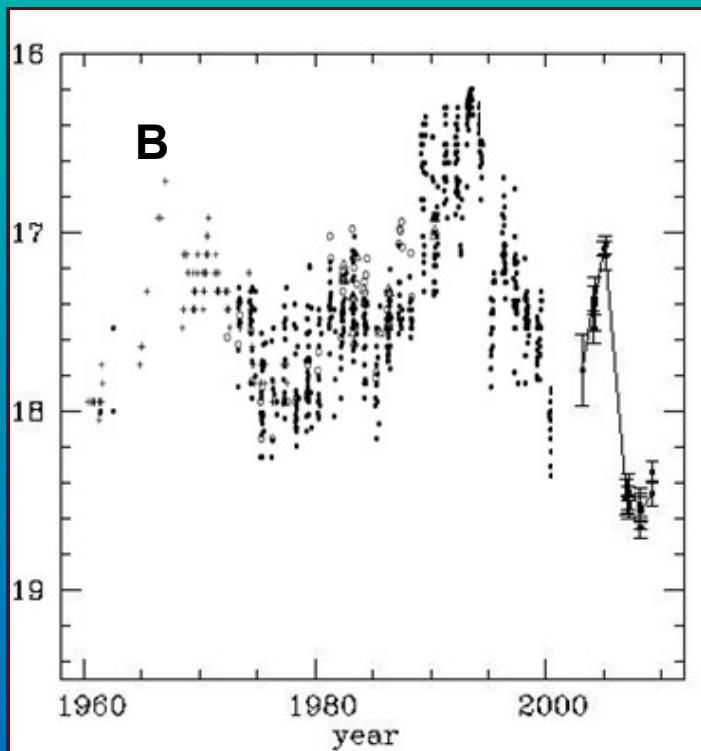
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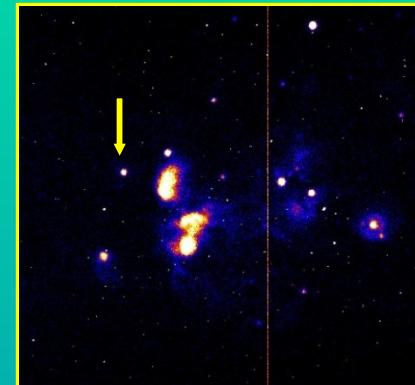
- The light curve of GR290
- New WHT spectrum (December 2008)
- Spectral variations (2003-2009)
- GR 290 and the Evolution of Massive Stars

# The photometric behaviour

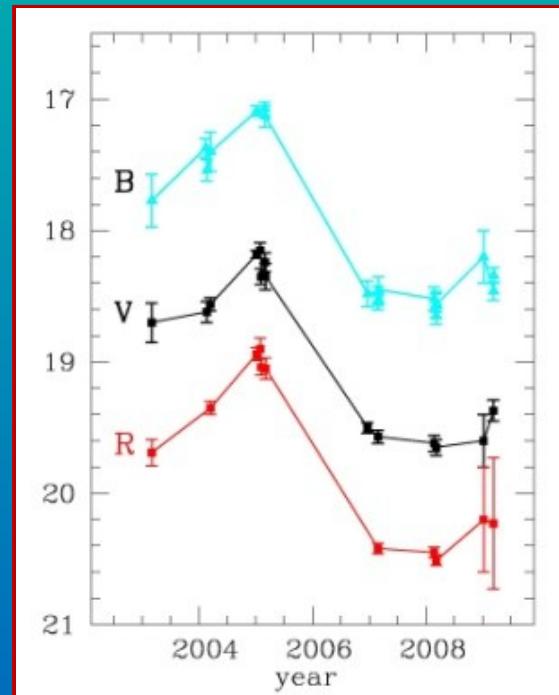
Located 17' (4.2 kpc) to NE from the M33 center, near the OB89 cluster, GR 290 is characterized by high temperature, high intrinsic luminosity and ample S Dor-type photometric variations:



The historical light curve of GR290 from 1960 to 2009 (Romano 1978, Sholukhova et al. 2002, Kurtev et al 2001, Polcaro et al 2009)

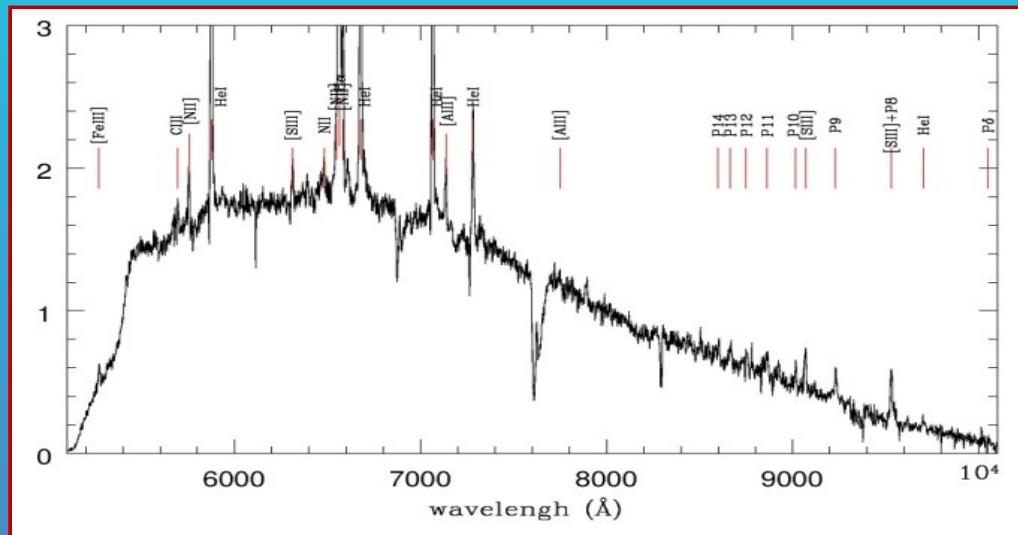
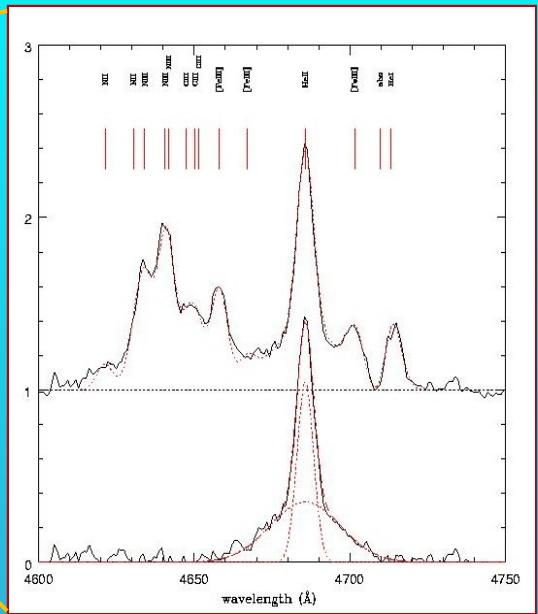
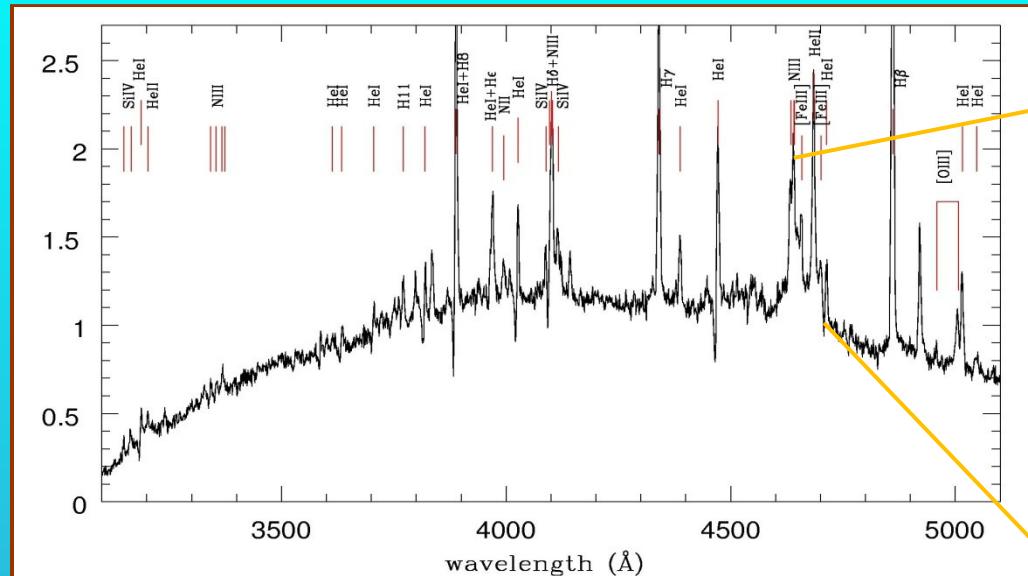


H $\alpha$  image of M33 near GR 290 (Loiano Observatory).



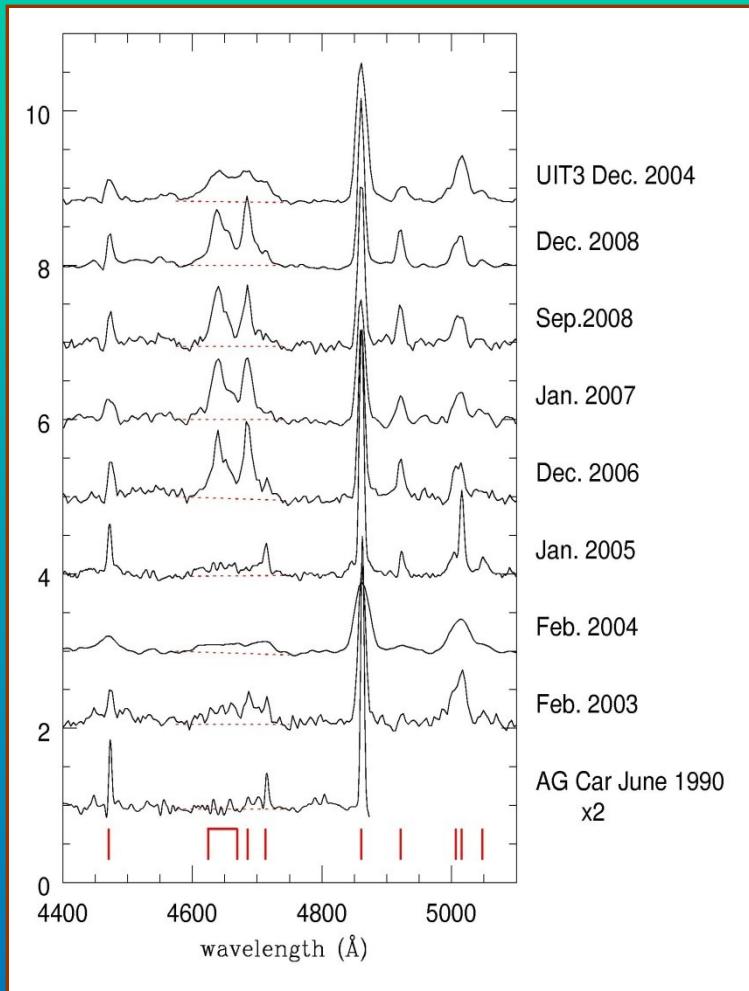
The recent light curve in B, V (+1<sup>m</sup>) and R (+2<sup>m</sup>) (Viotti et al 2007, Polcaro et al. 2009)

# **The spectrum of December 2008 (WHT)**



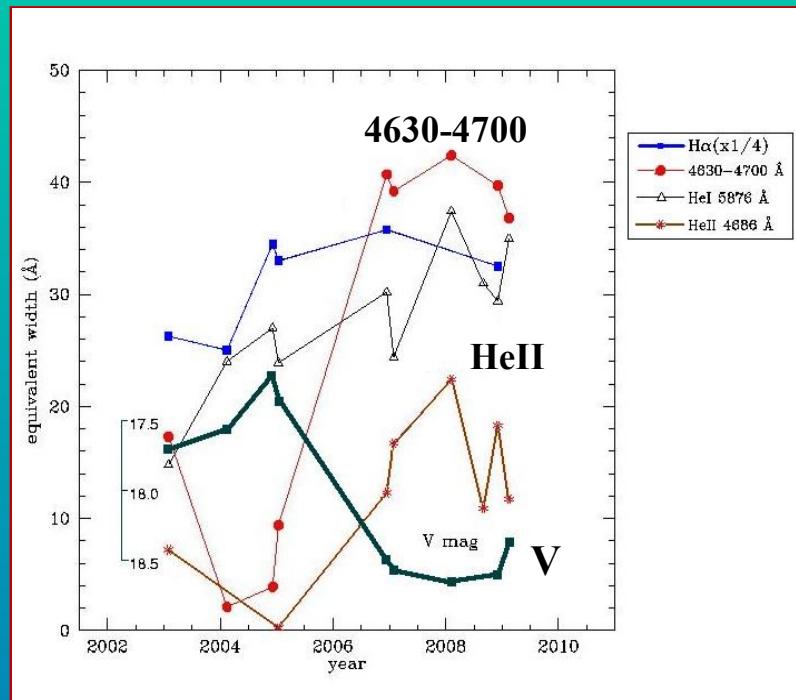
**Upper:**  
Fit of the 4630-4700 Å blend.  
**Lower:**  
Hell broad (FWHM 1700 km/s)  
and narrow components after  
subtraction of the other  
contributors.

# GR 290: spectral variations (2003-2009)



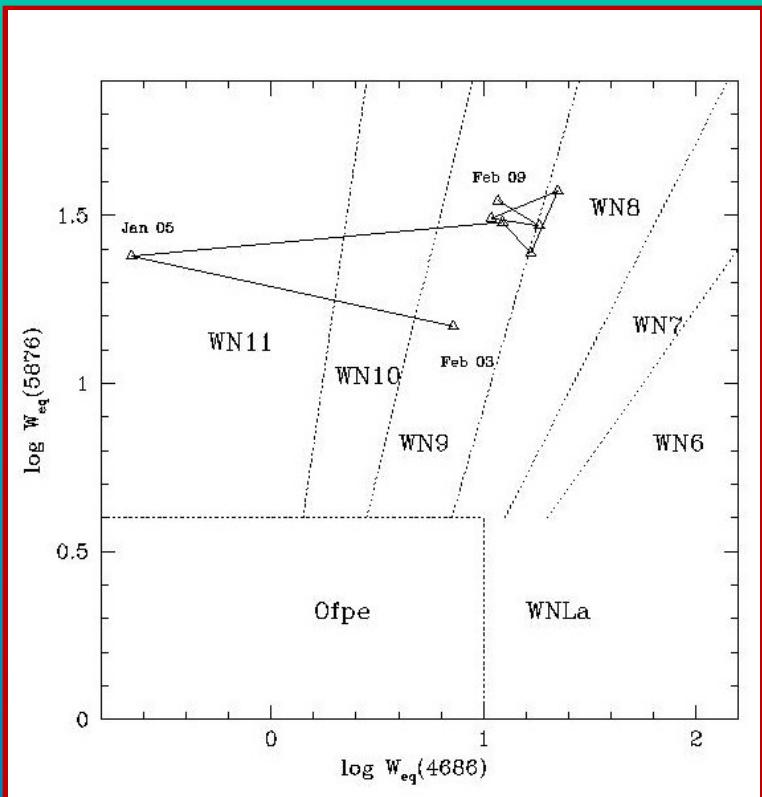
Spectral variations

→ Very hot LBV star

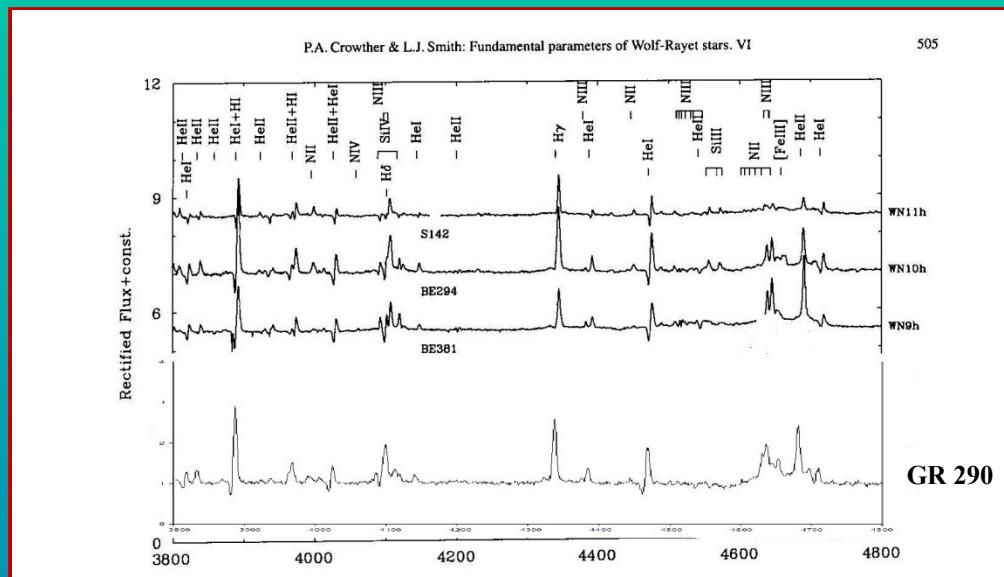


**Anticorrelation** between  
visual luminosity and  
strength of the 4630-4700  
blend.

# GR 290 and the WNL stars



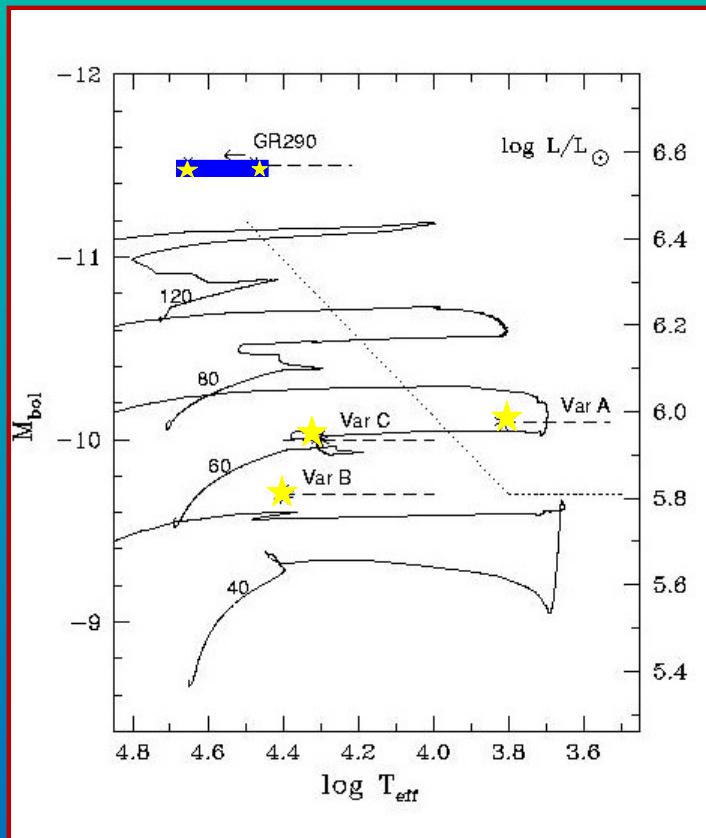
Path of GR290 in the 4686/5876 diagram of Crowther & Smith (1997)



LBVs during their wandering in the H-R diagram can evolve up to a WN8-9 spectral type and substantially change their surface temperature in a few years.

# GR 290 and the Most Massive Stars

H-R diagram of LBV in M33



Whatever theoretical evolutionary path be adopted, Romano's star appears to be a **very massive object**, and at present it is the **hottest ever observed LBV star**.

From Viotti et al. (2006) adapted (stars refer to objects' location in December 2004 and, for GR290, at present).

## Poster's References:

- [1] Viotti R. F. et al. 2006 A&A 458, 225 (LBVs in M33)
- [2] Romano G. 1978 A&A 67, 291 (Romano's Star)
- [3] Kurtev R. et al. 2001 Rev. Mex. A&A 37, 57 (Romano's Star)
- [4] Sholukhova O., Fabrika S. 2000 ASP Conf Ser 221, 171 (LBVs in M33)
- [5] Polcaro V. F. et al. 2003 A&A 411, 193 (GR 290)
- [6] Viotti R. F. et al. 2007 A&A 464, L53 (hot phase of GR 290)
- [7] Polcaro V. F. et al. 2009, in preparation (GR 290)
- [8] Crowther P. A. & Smith L. J. 1997 A&A 320, 500 (WNLs in LMC)
- [9] Massey P. et al. 2007 AJ 134, 2474 (LBVs in M33 ... )
- [10] Viotti R. et al. 1993 A&A 276, 432 (hot phase of AG Car)
- [11] Fabrika S. et al. 2005 A&A 437, 217 (B416 and GR290)
- [12] van Genderen A. M. 2001 A&A 366, 508 (S Dor variables)